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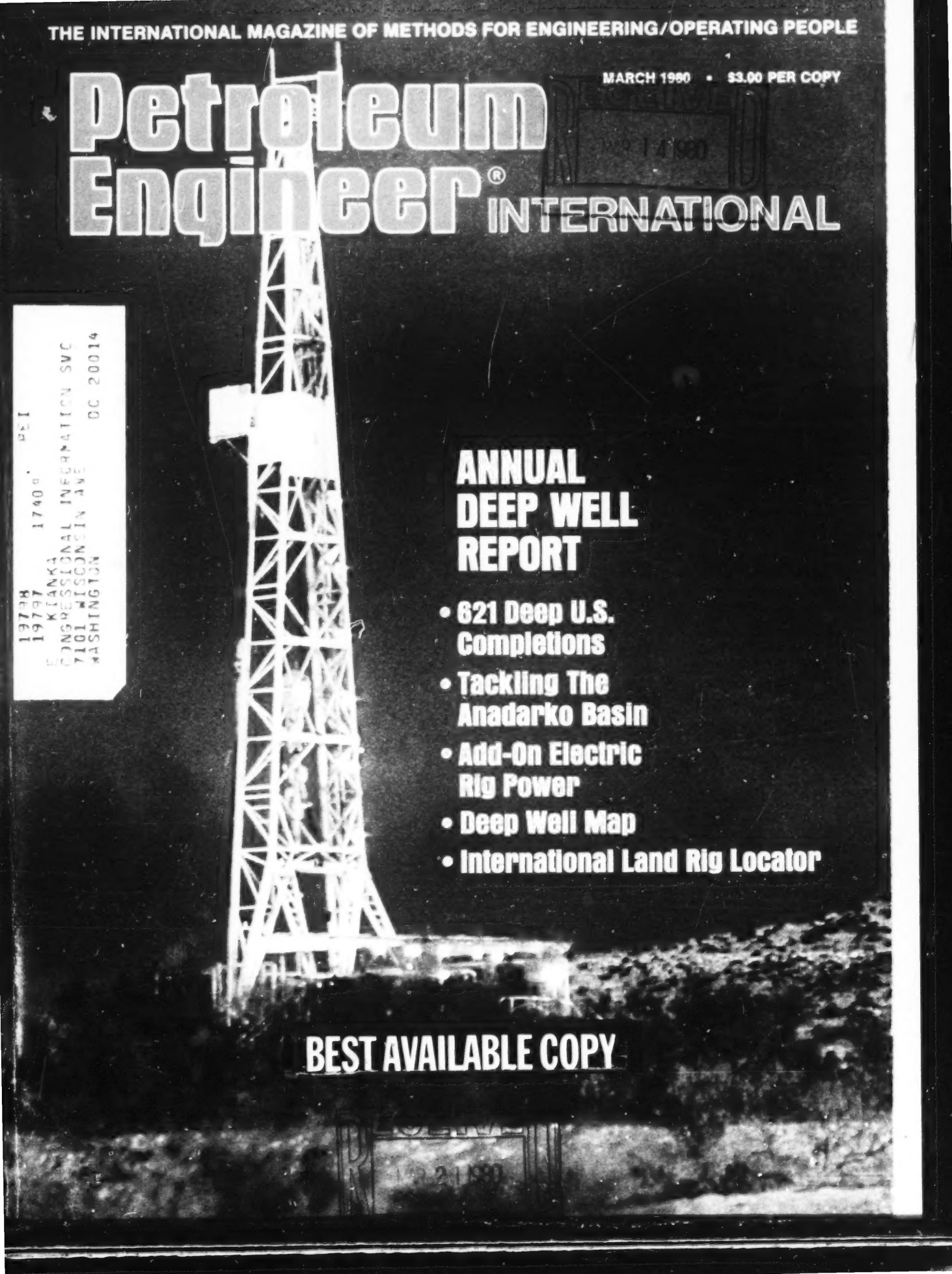

ANNUAL DEEP WELL REPORT

- 621 Deep U.S. Completions
- Tackling The Anadarko Basin
- Add-On Electric Rig Power
- Deep Well Map
- International Land Rig Locator

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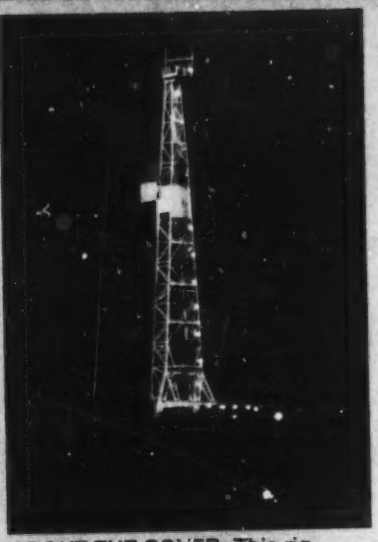

ABOUT THE COVER: This rig, drilling for Marathon Oil Co. in the Yates field in West Texas, is typical of those used to put down a record total of 621 deep wells in the U.S. last year. Deep well map and stories begin on page 19.

NEXT ISSUE: The special mid-March issue this year will look at innovative offshore production techniques being put to the test in the North Sea.

Petroleum Engineer® INTERNATIONAL

The international magazine of methods for engineering/operating people

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U.S. DEEP DRILLING — 1979

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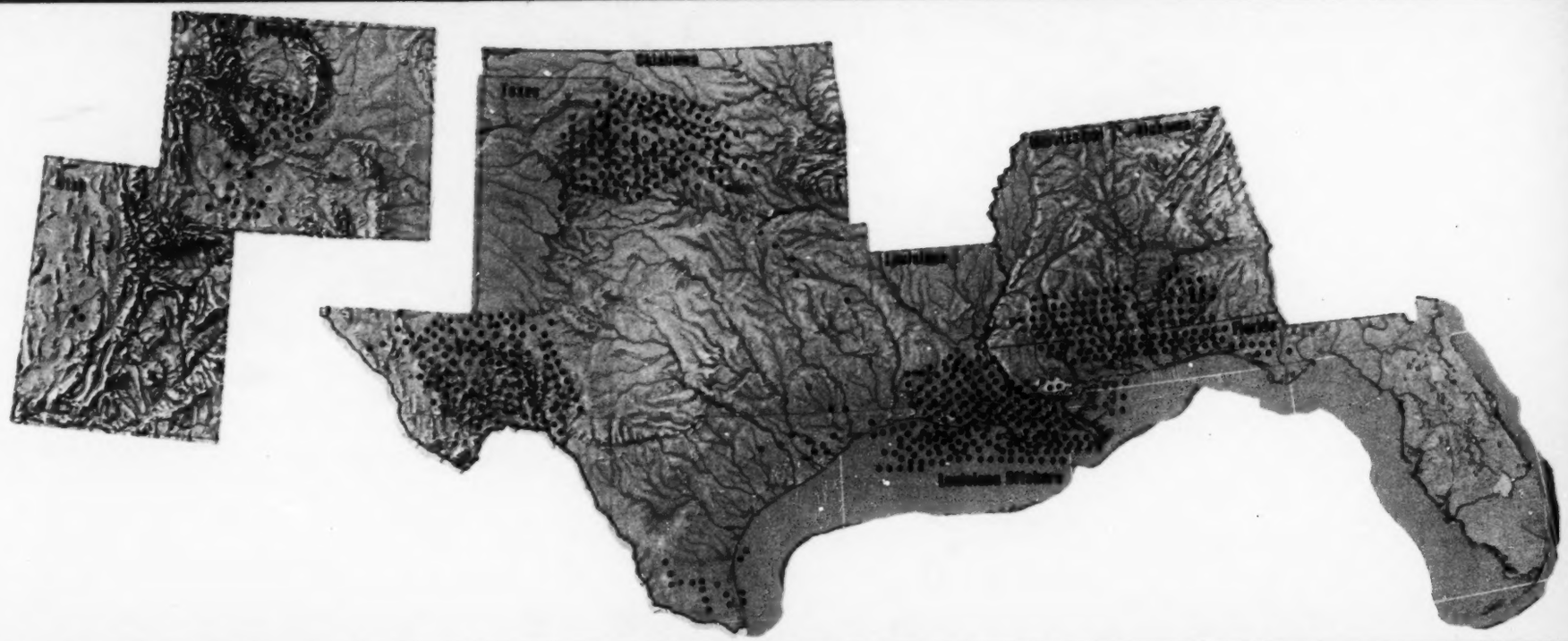
621 DEEP WELLS IN 1979

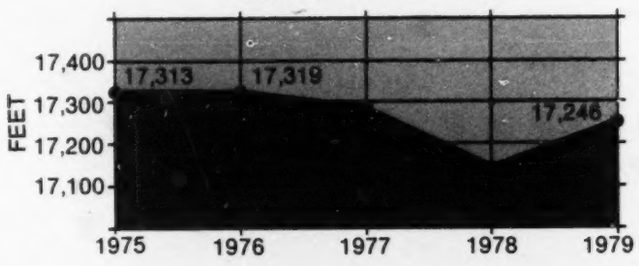
Based on PETROLEUM ENGINEER INTERNATIONAL'S Annual Deep Well Survey

Deep Well Operators

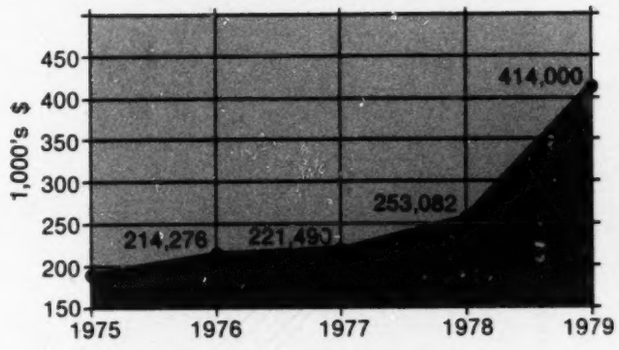
Adobe Oil & Gas Corp.
Amarex Inc.
Amarillo Oil Co.
Amax Petroleum Corp.
Amerada Hess Corp.
American Natural Gas Production Co.
American Quasar Petroleum Co.
American Quasar Petroleum Co.
Amoco Production Co.
Andover Oil Co.
The Anschutz Corp.
An-Son Corp.
Apache Corp.
Arkla Exploration Co.
ARCO Oil and Gas, a Division of Atlantic Richfield Co.
Bradco Oil & Gas Co.
C. F. Braun & Co.
Border Exploration Co.
Browning & Welch
BTA Oil Producers
C & K Petroleum Inc.
Callon Petroleum Co.
William E. Carl
Champlin Petroleum Co.
Chaparral Resources Inc.
Chevron U.S.A. Inc.
CIG Explorations, Inc.
CNG Producing Co.
Dalton H. Cobb
Cobopco Inc.
Conoco INc.
Conquina Oil Corp.
Coronado Minerals Co.
Cotton Petroleum Corp.
John L. Cox
Daniel Oil & Gas Inc.
Davis Oil Co.
Denison Mines (US) Inc.
Diamond Shamrock Corp.
Dome Petroleum Corp.
The Dow Chemical Corp.
Dyco Petroleum Corp.
Eldorado Gas Co.
Elf Aquitaine Oil and Gas
El Paso Natural Gas Co.
Entex Petroleum Inc.
E T S Enterprises
Exchange Oil & Gas Corp.
Exxon Corp.
Ferguson Oil & Gas Co. Inc.
First Energy Corp.
Florida Exploration Co.
Forest Oil Corp.
L. R. French Jr.
General Crude Oil Co.
Getty Oil Co.
The GHK Co.
Gifford, Mitchell & Wisenbaker
Goldking Production Co.
Grace Petroleum Corp.
Guardian Oil Co.
Gulf Oil Exploration and Production Co.
Hanson Oil Corp.
Harkins & Co.
Harper Oil Co.
Helmerich & Payne Inc.
Highland Resources Inc.
A. G. Hill
Hilliard Oil & Gas Inc.
HNG Oil Co.
Home Petroleum Corp.
Hoover & Bracken Energies Inc.
Houston Oil & Minerals Corp.
Hughes and Hughes Oil and Gas
Hunt Energy Corp.
Husky Oil Co.
Inexco Oil Co.
International Oil & Gas Corp.
Jones-O'Brien Inc.
L. E. Jones Production
Kerr-McGee Corp.
Kilroy Co. of Texas Inc.
Kimball Production Co.
Roy E. Kimsey Jr.
Koch Exploration
Lear Petroleum Corp.
Leede Oil & Gas Inc.
LGS Exploration
Louisiana Land and Exploration Co.
LPCX Corp.
McCormick Oil & Gas Corp.
McMoran Exploration Co.
McMoran Offshore Exploration
McRae Exploration Inc.
Machil-Ross Petroleum Co.
Mack Oil
Mallard Exploration Inc.
Marathon Oil Co.
Marion Corp.
Tom F. Marsh
Mesa Petroleum Co.
Michigan Wisconsin Pipe Line Co.
Mitchell Energy Corp.
Mobil Oil Corp.
W. A. Moncrief
Monsanto Co.
Mosbacher Production Co.
MRT Exploration Co.
Louis Mullen
Napeco Inc.
Narmco Inc.
Natomas North America Inc.
Neuhoff Oil & Gas Corp.
North American Royalties Inc.
Northern Natural Gas Co.
Nova Energy
Patrick Petroleum Co.
Pel-Tex
C. B. Pennington
Pennzoil Producing Co.
The Petroleum Corp. of Delaware
Philcon
Placid Oil Co.
Pogo Producing Co.
Prairie Producing Co.
Pursue Energy Corp.
Quintana Petroleum Corp.
Rainbow Resources
Robinson Resource Development Co.
Rosewood Corp.
Sabine Production Co.
Samson Resources Co.
Saguine Ltd.
Shell Oil Co.
Signal Petroleum
Earl T. Smith & Associates
Sonat Exploration Co.
Southland Royalty Co.
South Louisiana Production Co.
Southport Exploration Inc.
The Stone Oil Corp.
Strata Energy Inc.
Sun Oil Co.
The Superior Oil Co.
System Fuels Inc.
Tamarack Petroleum Co. Inc.
Tenneco Oil Exploration & Production
Texaco Inc.
Texas Crude Inc.
Texas Oil & Gas Corp.
Texas Pacific Oil Co. Inc.
Tomlinson Interests Inc.
Transco Exploration Co.
Jack L. Traver
Trigg Drilling Co. Inc.
Turner & Hickox Inc.
Union Oil Co. of California
Wainoco Oil Corp.
Clayton W. Williams Jr.
Williams Brothers Engineering Co.
Williams Exploration Co.
Woods Petroleum Corp.
Yates Petroleum Corp.
William K. Young



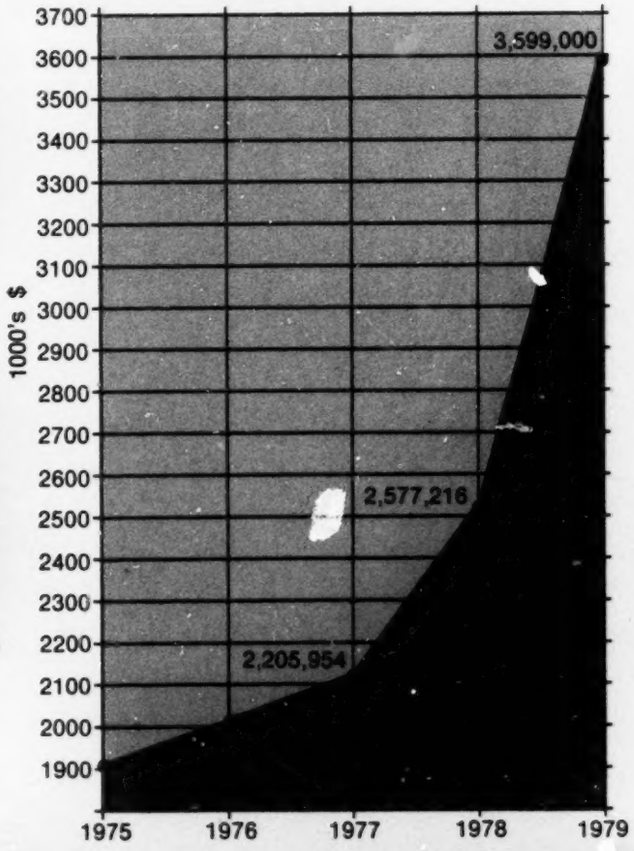
AVERAGE WELL DEPTH



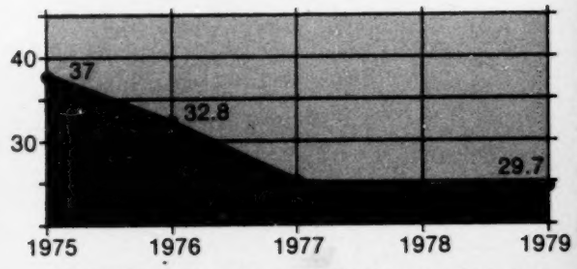
AVERAGE MUD COST PER WELL



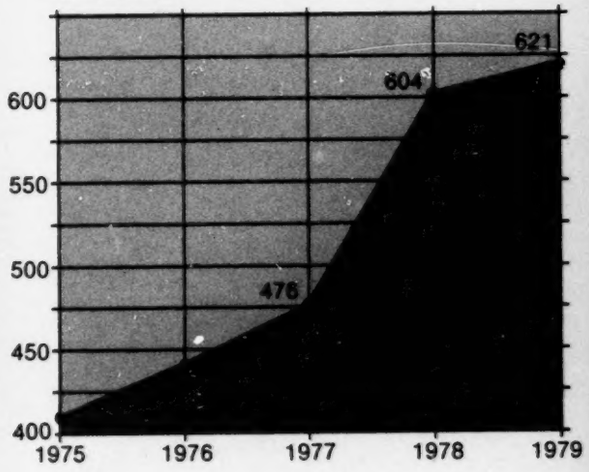
AVERAGE COST PER WELL



AVERAGE BITS PER WELL



NUMBER OF WELLS 15,000 FT & BELOW



621 Completions in '79

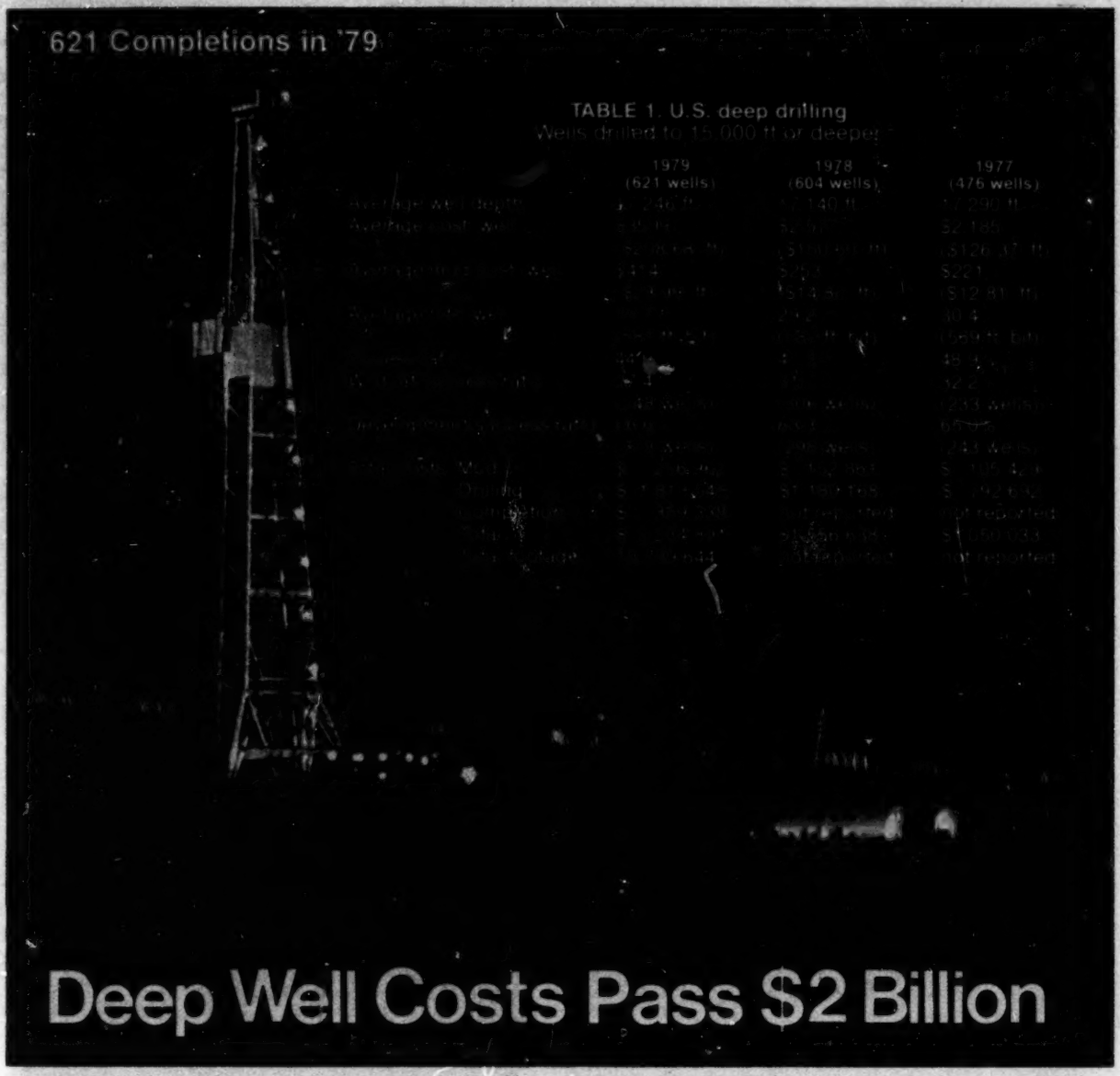


TABLE 1. U.S. deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (621 wells)	1978 (604 wells)	1977 (476 wells)

Deep Well Costs Pass $2 Billion

by Rich McNally, *Associate Editor*,
and Mary Jane Ellis, *Assistant Editor*

U.S. drillers completed a record total of 621 deep wells during 1979 at a cost of almost two-and-a-quarter billion dollars. The completions represented a 2.8% increase over 1978's 604 deep wells, while total cost was up a whopping 43% over 1978 costs which had, in turn, been up 48% over 1977's total.

Other statistics turned up by PETROLEUM ENGINEER INTERNATIONAL's annual Deep Well Report include an increase of slightly more than 100 ft in average depth of U.S. wells drilled to 15,000 ft or deeper during the year. This was a 0.6% increase over 1978, and it came at the expense of a per-footage cost increase of 38%.

Ultradeep drilling – those wells drilled to 20,000 ft or deeper – registered a six-year high in 1979 with 64 completions. They are covered in a separate article in this issue of PETROLEUM ENGINEER INTERNATIONAL (PEI).

Also featured in this issue of PEI is the annual Deep Well Map. It indicates that last year's 15,000-ft wells were put down by 128 operators. Only one of them drilled more than 30 deep wells. Three operators accounted for more than 20 deep wells apiece, and 100 of those remaining were content with five or less deep wells each. The number of operators last year represented a decrease of 30 from the 1978 total.

For the purposes of this report, completions are

defined as wells that have reached total depth, regardless of whether production equipment has been installed. In some instances, therefore, success ratios listed in the accompanying tables may be low. All wells that reached total depth during 1979 are included, although some of the ones listed as dry holes were still being tested as this issue went to press. Their classification, therefore, could change when final test results are in.

Leading deep-well state continues to be Louisiana, which reversed a two-year decline in deep offshore drilling last year and came up with a combined on-and-offshore total of 219. Oklahoma, where deep drilling has doubled in the past two years, was the site of 127 deep wells during 1979, with 69% of them being development wells aimed at exploitation of high-priced gas reserves in the Deep Anadarko Basin.

Texas slipped slightly as a deep-well state in 1979 after having gone ahead of Oklahoma the previous year. Major reason probably is movement of some big rigs out of the Permian Basin region of West Texas and New Mexico in favor of more-attractive deep gas prospects in Oklahoma and the Texas Panhandle. Texas was, however, site of the year's deepest completion, the 2 Emma Lou Unit No. 1 drilled by Gulf Oil Corp. in Pecos County. It was at total depth of 29,622 ft and still being tested as of this writing.

Removal last November of Federal price controls from gas produced from below 15,000 ft precipitated a mini-rush into the Sooner State by deep drillers anxious to tap the enormous gas supplies of the Anadarko Basin. The Potential Gas Committee of the Colorado School of Mines says Oklahoma contains an estimated 33 trillion cu ft (tcf) of undiscovered natu-

Location of 1979 wells 15,000 ft and deeper

State	Wells	Average bits/well	Average cost/well	Average mud cost/well
Alabama*	26	18.7	$ 2,378,000	$ 252,000
Alaska	1	111.0	38,000,000	1,700,000
California	1	50.0	1,500,000	230,000
Florida	7	13.6	2,678,000	180,000
Louisiana*	219	31.3	3,949,000	496,000
Mississippi	73	22.1	2,092,000	295,000
New Jersey	7	55.4	13,044,000	604,000
New Mexico	7	25.0	2,105,000	225,000
Oklahoma	127	29.2	3,201,000	366,000
Texas*	105	26.6	3,327,000	357,000
Utah	3	69.3	5,137,000	872,000
Wyoming	45	43.1	4,889,000	551,000

* Includes offshore

Wells completed 15,000 ft and below by years of completion

Year	No. wells by date of completion	Explor-atory	Total producers	Average bits/well	Mud costs average	Well costs average	Average costs/ft	Total footage drilled	Average ft/well	New Records Deepest well	New Records Deepest producer
1938	1	1	1	–	–	–	–	15,004	–	15,004	13,175
1944	1	1	0	–	–	–	–	15,279	–	15,279	–
1945	3	3	0	222	–	–	–	63,480	15,870	16,855	–
1946	1	1	1	–	–	–	–	15,452	–	–	–
1947	8	8	1	181	$ 24,000	$ 570,000	$ 35.87	127,128	15,891	17,823	13,904
1948	7	6	2	303	28,000	551,000	34.34	112,329	16,047	–	14,255
1949	11	8	5	199	64,000	534,000	32.52	180,631	16,421	20,521	15,530
1950	5	2	3	181	63,000	557,000	36.72	78,565	15,713	–	–
1951	12	5	6	116	54,000	527,000	33.56	189,864	15,822	–	–
1952	25	17	9	138	66,000	549,000	34.77	396,850	15,874	–	16,012
1953	25	14	20	159	75,000	729,000	44.79	402,936	16,177	21,482	17,895
1954	56	30	31	117	92,000	651,000	40.87	892,021	15,929	–	–
1955	98	53	43	87	116,000	649,000	40.09	1,587,006	16,031	22,569	–
1956	155	77	78	89	122,000	683,000	42.18	2,510,050	15,968	–	20,745
1957	185	114	89	69	121,000	743,000	46.25	2,987,841	16,164	–	–
1958	197	136	100	79	107,000	692,000	43.18	3,171,762	16,019	–	–
1959	228	142	119	71	83,000	650,000	40.48	3,680,857	16,056	25,340	–
1960	242	134	136	66	86,000	675,000	42.50	3,858,622	15,945	–	–
1961	243	84	153	63	81,000	614,000	38.07	3,918,324	16,124	–	–
1962	254	74	130	63	92,000	654,000	38.00	4,414,300	17,000	–	–
1963	271	96	128	52	97,246	696,000	42.85	4,401,363	16,241	–	21,410
1964	308	141	150	51	95,507	653,256	39.33	5,115,936	16,610	–	21,793
1965	330	117	156	50	90,160	610,784	36.50	5,522,541	16,735	–	22,098
1966	398	130	149	71	84,007	727,996	42.20	6,893,785	17,252	–	22,483
1967	412	142	192	66.8	96,375	762,678	45.29	6,789,371	16,839	–	–
1968	406	150	194	65	100,305	889,991	52.13	6,931,232	17,072	–	22,790
1969	389	116	206	53.6	101,529	886,349	50.19	6,619,216	17,016	–	–
1970	381	108	189	53.7	117,874	999,343	57.87	6,579,870	17,270	25,600	–
1971	417	149	210	60.3	146,049	949,959	54.81	7,227,444	17,332	–	–
1972	506	230	290	43.6	103,507	919,484	54.21	8,513,278	16,963	30,050	24,548
1973	506	213	272	37.7	122,067	1,107,059	63.58	8,810,918	17,413	–	–
1974	446	220	258	36.9	168,426	1,456,522	84.09	7,726,056	17,323	31,441*	–
1975	410	191	190	37	197,279	1,901,017	109.80	7,098,330	17,313	–	–
1976	439	186	255	32.8	214,279	2,112,509	121.98	7,603,041	17,319	–	26,566**
1977	476	233	233	30.4	221,490	2,205,954	127.58	8,230,046	17,290	–	–
1978	604	306	298	29.2	253,082	2,577,216	150.60	10,299,285	17,140	–	–
1979	821	548	279	28.7	$414,000	$3,599,000	$208.68	18,708,844	17,248	31,441	29,526

*This is the all-time record depth hole, completed in Oklahoma's Anadarko Basin in May 1974 by Lone Star Producing Co.
**Chevron USA established the record depth production mark in 1977 with completion of No. 1 Hollister in Wheeler County, Texas. Gage was 2,540,000 cu ft from the Atoka at 25,427-26,516 ft.

ral gas resources shallower than 15,000 ft, and 76 tcf below 15,000 ft. Most of it is in the Anadarko Basin, where more than 100 rigs were drilling toward 15,000 ft plus at the beginning of this year. Approximately 30 of them were drilling toward 20,000 ft or deeper.

Robert A. Hefner III, president of GHK Co., Oklahoma City, says that between 60 and 300 tcf of gas are available in the Anadarko Basin if sediments below 30,000 ft are included. He looks for drilling in the Basin to head toward 50,000 ft within the next decade. Present deepest commercial gas production in the U.S. is from 26,518 ft in Chevron USA's Ruth Ledbetter No. 1 well on the Texas side of the Anadarko Basin in Wheeler County. It was completed in 1977.

Arkansas is not credited with any 1979 deep completions on the accompanying charts, but the state did set a depth record of sorts when MRT Exploration Co. and Harvey Broyles re-entered the W.L. Sinclair No. 1 Douglass in Hempstead County. It had been abandoned with TD of 13,778 ft in 1972, but the re-

TABLE 4. Alaska deep drilling
Wells drilled to 15,000 ft or deeper

	1979 [1 well]	1978 [2 wells]	1977 [2 wells]
Average well depth	20,102 ft	15,709 ft	16,845 ft
Average cost/well	$38,000	$17,700	$2,880
	($1,890./ft)	($1,126./ft)	($170.95/ft)
Average mud cost/well	$1,700	$526	$329
	($84.57/ft)	($33.49/ft)	($19.50/ft)
Average bits/well	111.0	102.0	43.5
	(181 ft/bit)	(154 ft/bit)	(387 ft/bit)
Success ratio	0.0%	0.0%	50.0%
Wildcat success ratio	0.0%	0.0%	0.0%
	(1 well)	(2 wells)	(1 well)
Development success ratio	0.0%	0.0%	100.0%
	(0 wells)	(0 wells)	(1 well)
Total costs: Mud	$ 1,700	$ 1,052	$857.00
Drilling	$13,400	$21,000	$ 5,535
Completion	$ 0	not reported	not reported
Total	$38,000	$35,400	$ 5,759
Total footage	20,102	not reported	not reported

TABLE 2. Alabama deep drilling
Wells drilled to 15,000 ft or deeper

	1979 [23 wells]	1978 [28 wells]	1977 [25 wells]
Average well depth	17,803 ft	16,429 ft	16,506 ft
Average cost/well	$2,273	$1,789	$1,650
	($127.68/ft)	($97.06/ft)	($99.97/ft)
Average mud cost/well	$202	$183	$181
	($11.33/ft)	($9.93/ft)	($9.76/ft)
Average bits/well	18.4	19.5	20.6
	(968 ft/bit)	(843 ft/bit)	(897 ft/bit)
Success ratio	44.0%	45.0%	44.0%
Wildcat success ratio	11.1%	16.7%	0.0%
	(9 wells)	(6 wells)	(7 wells)
Development success ratio	62.5%	57.1%	61.1%
	(16 wells)	(14 wells)	(18 wells)
Total costs: Mud	$5,044	$3,681	$4,518
Drilling	$49,550	$23,692	$30,3..
Completion	$8,895	not reported	not reported
Total	$58,838	$35,772	$46,251
Total footage	445,201	not reported	not reported

TABLE 5. California deep drilling
Wells drilled to 15,000 ft or deeper

	1979 [1 well]	1978 [3 wells]	1977 [0 wells]
Average well depth	15,059 ft	18,459 ft	0
Average cost/well	$1,500	$5,456	0
	($99.61/ft)	($294.47/ft)	
Average mud cost/well	$230	$765	0
	($15.27/ft)	($41.44/ft)	
Average bits/well	50.0	63.0	0
	(301 ft/bit)	(293 ft/bit)	
Success ratio	0.0%	0.0%	0
Wildcat success ratio	0.0%	0.0%	0
	(1 well)	(3 wells)	
Development success ratio	0.0%	0.0%	0
	(0 wells)	(0 wells)	
Total costs: Mud	$ 230	$ 2,295	
Drilling	$ 1,500	$14,902	
Completion	$ 0	not reported	
Total	$ 1,500	$16,307	
Total footage	15,059	not reported	

TABLE 3. Alabama offshore deep drilling
Wells drilled to 15,000 ft or deeper

	1979 [1 well]	1978 [0 wells]	1977 [0 wells]
Average well depth	21,113 ft	0	0
Average cost/well	$5,000	0	0
	($236.82/ft)		
Average mud cost/well	$1,100	0	0
	($52.05/ft)		
Average bits/well	27.0	0	0
	(782 ft/bit)		
Success ratio	0.0%	0	0
Wildcat success ratio	0.0%	0	0
	(1 well)		
Development success ratio	0.0%	0	0
	(0 wells)		
Total costs: Mud	$ 1,500		
Drilling	$ 5,000		
Completion	$ 0		
Total	$ 5,000		
Total footage	21,113		

TABLE 6. Florida deep drilling
Wells drilled to 15,000 ft or deeper

	1979 [7 wells]	1978 [12 wells]	1977 [5 wells]
Average well depth	15,862 ft	15,929 ft	16,355 ft
Average cost/well	$2,678	$1,665	$1,357
	($168.80/ft)	($104.57/ft)	($82.98/ft)
Average mud cost/well	$160	$104	$89
	($10.06/ft)	($6.50/ft)	($5.45/ft)
Average bits/well	13.6	12.6	18.4
	(1,169 ft/bit)	(1,266 ft/bit)	(897 ft/bit)
Success ratio	71.4%	50.0%	60.0%
Wildcat success ratio	0.0%	0.0%	0.0%
	(0 wells)	(4 wells)	(1 well)
Development success ratio	71.4%	75.0%	75.0%
	(7 wells)	(8 wells)	(4 wells)
Total costs: Mud	$ 1,117	$ 1,242	$ 446
Drilling	$ 18,149	$17,865	$6,240
Completion	$ 1,694	not reported	not reported
Total	$ 18,743	$19,987	$6,784
Total footage	111,036	not reported	not reported

TABLE 7. Louisiana deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (176 wells)	1978 (153 wells)	1977 (131 wells)
Average well depth	17,248 ft	17,135 ft	17,074 ft
Average cost/well	$3,707	$2,353	$2,057
	($214.94/ft)	($137.30/ft)	($120.50/ft)
Average mud cost/well	$496	$298	$260
	($28.77/ft)	($17.28/ft)	($15.22/ft)
Average bits/well	31.9	30.6	31.1
	(541 ft/bit)	(560 ft/bit)	(548 ft/bit)
Success ratio	37.4%	43.1%	48.1%
Wildcat success ratio	12.3%	27.0%	32.3%
	(57 wells)	(74 wells)	(62 wells)
Development success ratio	49.2%	58.2%	62.3%
	(122 wells)	(79 wells)	(69 wells)
Total costs: Mud	$ 88,809	$ 45,315	$ 34,048
Drilling	$ 553,101	$241,174	$213,004
Completion	$ 99,332	not reported	not reported
Total	$ 663,596	$359,957	$269,527
Total footage	3,087,347	not reported	not reported

(Cost in thousand dollars except dollars per foot)

TABLE 8. Louisiana offshore deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (40 wells)	1978 (29 wells)	1977 (26 wells)
Average well depth	16,259 ft	16,554 ft	16,314 ft
Average cost/well	$5,032	$3,688	$3,202
	($309.49/ft)	($222.79/ft)	($196.27/ft)
Average mud cost/well	$497	$310	$292
	($30.58/ft)	($18.71/ft)	($17.88/ft)
Average bits/well	28.5	30.0	30.6
	(570 ft/bit)	(551 ft/bit)	(533 ft/bit)
Success ratio	45.0%	45.0%	19.4%
Wildcat success ratio	11.8%	33.3%	0.0%
	(17 wells)	(9 wells)	(17 wells)
Development success ratio	69.8%	54.5%	36.8%
	(23 wells)	(11 wells)	(19 wells)
Total costs: Mud	$ 19,888	$ 6,195	$ 10,501
Drilling	$177,241	$57,078	$ 98,619
Completion	$ 22,548	not reported	not reported
Total	$201,277	$73,763	$115,285
Total footage	650,346	not reported	not reported

(Cost in thousand dollars except dollars per foot)

TABLE 9. Mississippi deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (73 wells)	1978 (81 wells)	1977 (79 wells)
Average well depth	17,025 ft	17,142 ft	17,153 ft
Average cost/well	$2,092	$1,746	$1,278
	($122.87/ft)	($101.87/ft)	($74.48/ft)
Average mud cost/well	$295	$159	$125
	($17.35/ft)	($9.29/ft)	($7.27/ft)
Average bits/well	22.1	24.3	21.9
	(770 ft/bit)	(707 ft/bit)	(782 ft/bit)
Success ratio	42.5%	38.5%	38.0%
Wildcat success ratio	20.7%	14.3%	23.8%
	(29 wells)	(42 wells)	(42 wells)
Development success ratio	56.3%	59.2%	54.1%
	(44 wells)	(49 wells)	(37 wells)
Total costs: Mud	$ 21,559	$ 14,487	$ 9,851
Drilling	$ 116,537	$121,087	$ 72,497
Completion	$ 35,934	not reported	not reported
Total	$ 152,700	$158,907	$100,929
Total footage	1,242,808	not reported	not reported

(Cost in thousand dollars except dollars per foot)

entry went to 17,349 ft before being plugged back to 12,500 ft for tests and abandoned. The state's previous depth mark was 16,611 ft at the Humble No. 1 Georgia-Pacific in Ashley County. It was completed in 1968.

Mississippi, where the average depth of all wells is almost twice the national average, completed 73 deep wells last year at an average cost of $2,092,000 apiece. That was by no means the highest average for any state, however. Wyoming's 45 deep wells cost an average of $4,889,000 to drill and complete. In nearby Utah, three deep wells drilled during 1979 cost an average of $5,137,000 apiece.

Not counting Alaska, the most expensive deep drilling state last year was New Jersey, where seven offshore wells cost a total of $91,309,000; an average of $13,044,000 apiece. Alaska's one deep well, drilled onshore to 21,102 ft, cost $38,000,000. Much of that extraordinary cost can be traced to the peculiarities of North Slope drilling – transportation of equipment and supplies over long distances, construction of roads and drilling pad, etc. The well was dry, however, so there were no completion costs.

This year's Deep Well Report, by the way, is the first to breakout completion costs in addition to conventional mud and drilling costs. This added feature of the report indicates that 16% of deep drilling expenses go for completing wells. The bulk of the cost (81%) is charged to drilling, and 11% is attributable to mud costs. These figures add up to slightly more than 100% because of overlaps and the fact that not all operators report costs in the same way. A few operators, for example, breakout mud costs but also include them in total drilling costs. For this reason, total cost in the accompanying tables rarely equals the sum of mud, drilling, and completion costs.

Also new to the Deep Well Report this year is inclusion of names of contract drillers; 102 of whom participated in drilling the year's 621 deep wells.

The use of 29.7 bits/well last year slowed a trend toward fewer bits/well that has seen the average drop by about 20 bits each decade since the late 1950's.

Contractors

A & P Drilling Co.
Anderson-Myers Drilling Co.
Apollo Drilling & Exploration Co.
Asiatic Drilling Co.
Pernie Bailey Drilling Co.
Baker & Taylor Drilling Co.
Barrett Drilling Co.
Bay Drilling Co.
Big Chief Drilling Co.
Bomac Drilling
Brinkerhoff-Signal Inc.
Butler Drilling Co.
Butler-Johnson Inc.
Buzzini Drilling Co.
Cactus Drilling Corp.
Chase Drilling Co.
Chesley Pruet Drilling Co.
Choya Drilling Co.
Cliffs Drilling Co.
Columbia Drilling Co.
Comet Drilling Co.
Core Drilling Co.
Core Oil and Gas Corp.
Davis Drilling Co.
Delta Drilling Co.
Diamond M Drilling Co.
Dixilyn Field Drilling Co.
Dual Drilling Co.
Eason ITT Oil Co.
Eljay Drilling Corp.
Exeter Drilling Northern Inc.
Explorer Drilling Co.
Forwest Inc.
FWA Drilling Co. Inc.
Glasscock Drilling Inc.
Globe Drilling Co.
Global Marine Drilling Co.
Goldrus Drilling Co.
Grey Wolf Drilling Co.
Harkins & Co.
Helmerich & Payne International Drilling
H. B. Hinton Drilling Co. Inc.
Honeymon Drilling Co. Ltd.
Inland Well Service Inc.
Intrepid Drilling Corp.
Jernigan Drilling Co.
L. E. Jones
Justiss Mears Oil Co. Inc.
Larco Drilling Co. Inc.
Loffland Brothers Co.
R. L. Manning Co.

TABLE 10. New Jersey offshore deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (7 wells)	1978 (5 wells)	1977 (0 wells)
Average well depth	17,210 ft	17,230 ft	0
Average cost/well	$13,044 ($757.98/ft)	$17,160 ($995.96/ft)	0
Average mud cost/well	$604 ($35.11/ft)	$752 ($43.65/ft)	0
Average bits/well	55.4 (310 ft/bit)	50.0 (345 ft/bit)	0
Success ratio	28.6%	20.0%	0
Wildcat success ratio	28.6% (7 wells)	20.0% (5 wells)	0
Development success ratio	0.0% (0 wells)	0.0% (0 wells)	0
Total costs: Mud	$ 4,230	$ 3,760	
Drilling	$ 73,294	$73,100	
Completion	$ 18,015	not reported	
Total	$ 91,309	$85,800	
Total footage	120,467	not reported	

(Cost in thousand dollars except dollars per foot)

TABLE 11. New Mexico deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (7 wells)	1978 (4 wells)	1977 (5 wells)
Average well depth	16,198 ft	15,679 ft	17,229 ft
Average cost/well	$2,105 ($129.98/ft)	$1,854 ($118.22/ft)	$1,587 ($91.74/ft)
Average mud cost/well	$225 ($13.92/ft)	$ [illegible] ($8.91/ft)	$99 ($5.75/ft)
Average bits/well	25.0 (648 ft/bit)	31.3 (502 ft/bit)	27.7 (625 ft/bit)
Success ratio	71.4%	75.0%	83.3%
Wildcat success ratio	75.0% (4 wells)	66.6% (3 wells)	80.0% (5 wells)
Development success ratio	66.7% (3 wells)	100% (1 well)	100.0% (1 well)
Total costs: Mud	$ 1,578	$ 559	$ 597
Drilling	$ 10,855	$5,560	$7,989
Completion	$ 3,881	not reported	not reported
Total	$ 14,736	$7,414	$9,522
Total footage	113,386	not reported	not reported

(Cost in thousand dollars except dollars per foot)

TABLE 12. Oklahoma deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (127 wells)	1978 (109 wells)	1977 (93 wells)
Average well depth	17,143 ft	16,975 ft	16,817 ft
Average cost/well	$3,201 ($186.70/ft)	$2,582 ($152.13/ft)	$2,230 ($132.61/ft)
Average mud cost/well	$366 ($21.33/ft)	$234 ($13.79/ft)	$230 ($13.66/ft)
Average bits/well	29.2 (587 ft/bit)	28.5 (596 ft/bit)	30.1 (559 ft/bit)
Success ratio	54.3%	58.0%	65.1%
Wildcat success ratio	48.7% (39 wells)	54.2% (48 wells)	50.0% (28 wells)
Development success ratio	56.8% (88 wells)	61.5% (52 wells)	77.1% (35 wells)
Total costs: Mud	$ 46,438	$ 23,407	$ 14,469
Drilling	$ 331,828	$192,492	$109,881
Completion	$ 65,735	not reported	not reported
Total	$ 406,496	$255,369	$140,501
Total footage	2,177,211	not reported	not reported

(Cost in thousand dollars except dollars per foot)

Bits/well last year was up only half a bit from 1978, and part of that can be attributed to deeper average wells. Ft/bit, however, was off by 6 ft. This is not a knock on bits because part of the explanation can be found in the table for Florida, where bits are good for more than 1,000 ft of hole. That state's deep well count dropped almost in half last year, and the effect of that on the U.S. average was only partly offset by an increase in deep drilling in Alabama, where drillers are averaging 18 bits/well.

Hardest place to drill seems to be Utah, where drillers used 69.3 bits/well last year to drill three deep holes to an average depth of 18,135 ft. That comes to only 262 ft/bit. Baltimore Canyon drilling off New Jersey was only slightly better, averaging 55.4 bits/well.

Mud costs increased substantially last year to average $414,000/well, or $23.99/ft. The cost of mud has been going up along with everything else in recent years, but 1979 was the first time it jumped by as much as 60%. Usually, increases have been in the 8% to 15% range. The total mud bill for 1979 came to $256,962,000 – an increase of more than $100,000,000 over 1978 cost.

Deep drillers offshore Texas paid more than $1,000,000/well for mud. Aside from Alaska, the most expensive land area for mud last year was Utah, where deep drillers paid $48.10/ft. Wyoming was a distant second, with an average mud cost of $30.63/ft.

Deep Development Wells

The number of deep development wells in the U.S. moved ahead of wildcats last year after having fallen behind in 1978 for the first time since 1960. This is in keeping with the current emphasis on development drilling in the U.S. at the expense of wildcatting. And, it is a trend that is likely to continue among deep drillers as they continue to go after deep, unregulated gas deposits in existing fields.

California could improve substantially on its 1979 showing this year if hopes for a deep discovery in the

Marion Drilling Co. Inc.
Marine Drilling Co.
McVay Drilling Co.
Mercury Drilling Co.
Monterey Drilling Co.
Moran Brothers Inc.
E. W. Moran Drilling Co.
Moranco
Murco Drilling Co.
Nabors Alaska Drilling Inc.
Nicklos Drilling Co.
Nicor Drilling Co.
Noble Drilling Corp.
Nova Drilling Corp.
Ocean Drilling & Exploration Co.
O'Conner & Young Drilling Co.
Parker Drilling Co.
Penrod Drilling Co.
PMI Drilling Co.
Power Rig Drilling Co. Inc.
Progress Drilling & Marine Inc.
Ratliff Drilling Inc.
Richards Drilling Co.
Robinson Brothers Drilling Co.
Roden Drilling Co.
Rowan Drilling – U.S.
Salen Offshore Drilling Co.
Dean Shanks
Sharp Drilling Co. Inc.
Teledyne Mobile Offshore Inc.
Tesoro Petroleum Corp.
A. W. Thompson Inc.
Thompson Drilling Co.
Tiger Drilling Co.
Tiger Oil International Drilling Co.
TRG Drilling Corp.
Tri Service Drilling Co.
Trigg Drilling Co. Inc.
True Drilling Co.
Two R Drilling Co. Inc.
United Drilling Co. of Tyler
Universal Drilling Co.
Viersen & Cochran Drilling Co.
Warrior Drilling & Engineering Co. Inc.
Welsh Drilling & Service Inc.
Westburne Drilling Inc.
Western Oceanic
Wheless Drilling Co.
Fred Wilson Drilling Co. Inc.
Zapata Offshore Co.
Zenith Drilling Corp. Inc.

TABLE 13. Texas deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (181 wells)	1978 (152 wells)	1977 (91 wells)
Average well depth	17,554 ft	17,276 ft	18,336 ft
Average cost/well	$2,956	$2,445	$2,452
	($168.39/ft)	($141.53/ft)	($133.74/ft)
Average mud cost/well	$329	$258	$202
	($18.76/ft)	($14.91/ft)	($11.00/ft)
Average bits/well	25.9	27.0	32.2
	(677 ft/bit)	(640 ft/bit)	(570 ft/bit)
Success ratio	52.5%	50.0%	57.1%
Wildcat success ratio	38.5%	33.7%	42.6%
	(52 wells)	(83 wells)	(47 wells)
Development success ratio	67.3%	69.6%	72.7%
	(49 wells)	(69 wells)	(44 wells)
Total costs: Mud	$ 33,253	$ 18,363	$ 25,049
Drilling	$ 244,708	$162,594	$200,638
Completion	$ 50,093	not reported	not reported
Total	$ 298,553	$223,168	$254,143
Total footage	1,772,991	not reported	not reported

(Cost in thousand dollars except dollars per foot)

TABLE 14. Texas offshore deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (4 wells)	1978 (0 wells)	1977 (4 wells)
Average well depth	17,228 ft	0	15,852 ft
Average cost/well	$12,685	0	$3,361
	($736.31/ft)		($212.02/ft)
Average mud cost/well	$1,053	0	$288
	($61.11/ft)		($18.20/ft)
Average bits/well	43.3	0	20.5
	(398 ft/bit)		(773 ft/bit)
Success ratio	25.0%	0	0.0%
Wildcat success ratio	33.3%	0	0.0%
	(3 wells)		(3 wells)
Development success ratio	0.0%	0	0.0%
	(1 well)		(1 well)
Total costs: Mud	$ 4,211		$1,006
Drilling	$40,577		$5,984
Completion	$10,163		not reported
Total	$50,740		$9,831
Total footage	68,911		not reported

(Cost in thousand dollars except dollars per foot)

TABLE 15. Utah deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (3 wells)	1978 (4 wells)	1977 (7 wells)
Average well depth	18,135 ft	15,272 ft	17,211 ft
Average cost/well	$5,137	$2,250	$2,470
	($283.28/ft)	($147.33/ft)	($143.49/ft)
Average mud cost/well	$872	$210	$253
	($48.10/ft)	($13.75/ft)	($14.68/ft)
Average bits/well	69.3	56.0	67.3
	(262 ft/bit)	(273 ft/bit)	(256 ft/bit)
Success ratio	0.0%	25.0%	57.1%
Wildcat success ratio	0.0%	25.0%	33.3%
	(3 wells)	(4 wells)	(3 wells)
Development success ratio	0.0%	0.0%	75.0%
	(0 wells)	(0 wells)	(4 wells)
Total costs: Mud	$ 2,617	$ 840	$ 1,768
Drilling	$11,494	$6,912	$12,036
Completion	$ 300	not reported	not reported
Total	$15,412	$9,000	$17,268
Total footage	54,405	not reported	not reported

(Cost in thousand dollars except dollars per foot)

TABLE 16. Wyoming deep drilling
Wells drilled to 15,000 ft or deeper

	1979 (45 wells)	1978 (35 wells)	1977 (21 wells)
Average well depth	17,984 ft	17,292 ft	17,014
Average cost/well	$4,889	$3,303	$2,978
	($271.83/ft)	($191.03/ft)	($175.01/ft)
Average mud cost/well	$551	$285	$347
	($30.63/ft)	($16.50/ft)	($20.39/ft)
Average bits/well	43.1	44.5	46.5
	(417 ft/bit)	(388 ft/bit)	(366 ft/bit)
Success ratio	37.8%	62.9%	76.2%
Wildcat success ratio	28.0%	47.6%	54.5%
	(25 wells)	(21 wells)	(11 wells)
Development success ratio	50.0%	85.7%	100.0%
	(20 wells)	(14 wells)	(10 wells)
Total costs: Mud	$ 24,788	$ 9,992	$ 7,285
Drilling	$174,311	$ 89,990	$28,415
Completion	$ 44,750	not reported	not reported
Total	$219,993	$115,614	$82,528
Total Footage	809,301	not reported	not reported

(Cost in thousand dollars except dollars per foot)

Elk Hills Naval Petroleum Reserve pan out. Eight wildcats rigs were at work in the area at the beginning of 1980. Three were drilling below 15,000 ft, and five were on the way to 15,000 ft or deeper.

Another area to watch is Arizona, which could be a newcomer to the Deep Well Report in 1980. The deepest well ever drilled there is the Humble Oil and Refining Co. No. 1 State in Pima County. It went to 12,556 ft. The deepest producer ever drilled in Arizona bottomed at 6,793 ft.

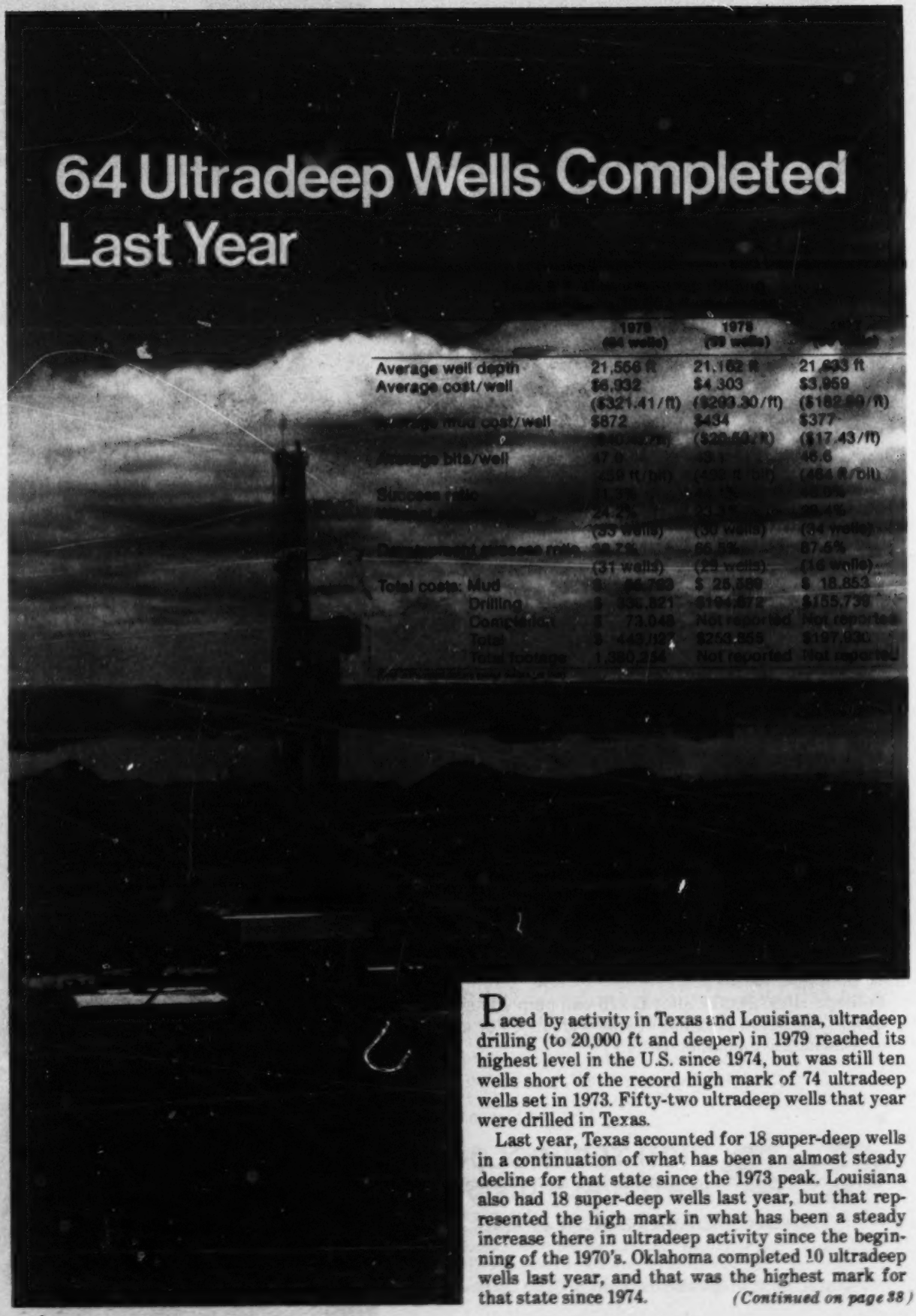
Now, however, an Anschutz Corp. group has just spudded the No. 1 State-Anschutz-Texoma about 60 miles southeast of Phoenix in Pinal County. Located on the Overthrust Belt, the wildcat is scheduled to go to 20,000 ft. Nearest U.S. production is about 300 miles to the northeast in Apache County.

In Mexico, Pemex is reported to have tapped large oil and gas deposits on that country's portion of the Overthrust 300 to 350 miles southeast of the Anschutz drillsite.

Nevada also could become a state to be reckoned with deep-well-wise if drillers can get by environmentalists to test an Overthrust region 20 miles west of Las Vegas. Nevada's deepest well so far is a 13,832-ft dry hole, and its deepest producer went to 8,581 ft. The area of interest these days is Red Rock Canyon, where oil is suspected of being entrapped 17,000 ft below ground. A decision on whether drilling will be permitted in the canyon – one of southern Nevada's most popular recreational areas – is expected before the middle of this year. ■

Note: PETROLEUM ENGINEER INTERNATIONAL has been analyzing U.S. deep drilling on an annual basis since 1944. Base data are acquired from various industry sources, including contract drilling companies and Petroleum Information, Denver, Colo. Operating companies confirm the wells and, through a special arrangement with PEI, provide cost data on a confidential basis. Mary Jane Ellis compiled the data for this report, which was written by Rich McNally.

64 Ultradeep Wells Completed Last Year



	1978 (64 wells)	1979 (39 wells)	[illegible]
Average well depth	21,556 ft	21,162 ft	21,633 ft
Average cost/well	$6,932 ($321.41/ft)	$4,303 ($203.30/ft)	$3,959 ($182.99/ft)
Average mud cost/well	$872	$434	$377
	[illegible]	($20.50/ft)	($17.43/ft)
Average bits/well	47.0	31	46.6
	459 ft/bit)	(492 ft/bit)	(464 ft/bit)
Success ratio	48.4%	79.5%	68.8%
	24.2%	64.1%	39.4%
	(33 wells)	(30 wells)	(34 wells)
Development success ratio	89.7%	86.5%	87.5%
	(31 wells)	(25 wells)	(16 wells)
Total costs: Mud	$ [illegible]	$ 25,589	$ 18,853
Drilling	$ [illegible]	$164,872	$155,736
Completion	$ 73,048	Not reported	Not reported
Total	$ 443,197	$253,855	$197,930
Total footage	1,380,254	Not reported	Not reported

Paced by activity in Texas and Louisiana, ultradeep drilling (to 20,000 ft and deeper) in 1979 reached its highest level in the U.S. since 1974, but was still ten wells short of the record high mark of 74 ultradeep wells set in 1973. Fifty-two ultradeep wells that year were drilled in Texas.

Last year, Texas accounted for 18 super-deep wells in a continuation of what has been an almost steady decline for that state since the 1973 peak. Louisiana also had 18 super-deep wells last year, but that represented the high mark in what has been a steady increase there in ultradeep activity since the beginning of the 1970's. Oklahoma completed 10 ultradeep wells last year, and that was the highest mark for that state since 1974. *(Continued on page 38)*

Average depth of the 64 ultradeep wells drilled in the U.S. last year was 21,566 ft, and their average cost was $6,932,000. With a success ratio of only 31.3%, average completion cost of all ultradeep wells came to little more than $1,140,000. Average mud cost was $872,000.

As indicated in the preceding article, all wells that reach total depth during the year are counted as completions in PETROLEUM ENGINEER INTERNATIONAL's annual Deep Well Report. Wells without hydrocarbon shows are counted as dry, although some of them may still be undergoing tests as the year ends. Success ratios, therefore, are subject to upgrading as final test results come in.

Nevertheless, last year's success ratio for ultradeep wells is way below normal, and is more than twice as low as the 70.2% scored by 57 ultradeep wells in 1971. Success ratio for ultradeep wildcats last year was even with the 1971 ratio for wildcats, but a poor show-

TABLE 2. Alabama ultradeep drilling
Wells drilled to 20,000 ft or deeper

	1979 (1 well)	1978 (0 wells)	1977 (0 wells)
Average well depth	20,353 ft	0	0
Average cost/well	$3,748	0	0
	($184.15/ft)	0	0
Average mud cost/well	$383	0	0
	(18.82/ft)		
Average bits/well	20.0	0	0
	(1,018 ft/bit)		
Success ratio	0.0%	0	0
Wildcat success ratio	0.0%	0	0
	(1 well)		
Development success ratio	0.0%	0	0
	(0 wells)		
Total costs: Mud	$ 383	0	0
Drilling	$ 3,111	0	0
Completion	$ 246	0	0
Total	$ 3,748	0	0
Total footage	20,353	0	0

(Cost in thousand dollars except dollars per foot)

TABLE 3. Alabama offshore ultradeep drilling
Wells drilled to 20,000 ft or deeper

	1979 (1 well)	1978 (0 wells)	1977 (0 wells)
Average well depth	21,113 ft	0	0
Average cost/well	$5,000	0	0
	($236.82/ft)	0	0
Average mud cost/well	$1,500	0	0
	($71.05/ft)	0	0
Average bits/well	27.0	0	0
	(782 ft/bit)		
Success ratio	0.0%	0	0
Wildcat success ratio	0.0%	0	0
	(1 well)		
Development success ratio	0.0%	0	0
	(0 wells)		
Total costs: Mud	$ 1,500	0	0
Drilling	$ 5,000	0	0
Completion	$ 0	0	0
Total	$ 5,000	0	0
Total footage	21,113	0	0

(Cost in thousand dollars except dollars per foot)

TABLE 4. Alaska ultradeep drilling
Wells drilled to 20,000 ft or deeper

	1979 (1 well)	1978 (0 wells)	1977 (0 wells)
Average well depth	20,102 ft	0	0
Average cost/well	$38,000	0	0
	($1,890 /ft)	0	0
Average mud cost/well	$1,700	0	0
	($84.57/ft)	0	0
Average bits/well	111.0	0	0
	(181 ft/bit)	0	0
Success ratio	0.0%	0	0
Wildcat success ratio	0.0%	0	0
	(1 well)		
Development success ratio	0.0%	0	0
	(0 wells)		
Total costs: Mud	$ 1,700	0	0
Drilling	$13,400	0	0
Completion	$ 0	0	0
Total	$38,000	0	0
Total footage	20,102	0	0

(Cost in thousand dollars except dollars per foot)

TABLE 5. Louisiana ultradeep drilling
Wells drilled to 20,000 ft or deeper

	1979 (18 wells	1978 (16 wells)	1977 (10 wells)
Average well depth	21,332 ft	20,808 ft	21,192 ft
Average cost/well	$7,967	$4,165	$3,705
	($373.45/ft)	($200.18/ft)	($174.82/ft)
Average mud cost/well	$1,167	$415	$377
	($54.72/ft)	($19.92/ft)	($17.81/ft)
Average bits/well	43.2	35.5	38.1
	(494 ft/bit)	(586 ft/bit)	(556 ft/bit)
Success ratio	27.8%	50.0%	60.0%
Wildcat success ratio	28.6%	16.7%	42.9%
	(7 wells)	(6 wells)	(7 wells)
Development success ratio	27.3%	70.0%	100.0%
	(11 wells)	(10 wells)	(3 wells)
Total costs: Mud	$ 21,010	$ 6,634	$ 3,774
Drilling	$108,691	$47,421	$32,390
Completion	$ 30,898	not reported	not reported
Total	$143,411	$66,645	$37,047
Total footage	383,977	not reported	not reported

(Cost in thousand dollars except dollars per foot)

TABLE 6. Mississippi ultradeep drilling
Wells drilled to 20,000 ft or deeper

	1979 (6 wells)	1978 (10 wells)	1977 (6 wells)
Average well depth	21,568 ft	20,927 ft	21,877 ft
Average cost/well	$3,627	$4,171	$3,827
	($168.16/ft)	($199.31/ft)	($174.94/ft)
Average mud cost/well	$390	$348	$563
	($18.07/ft)	($16.62/ft)	($25.75/ft)
Average bits/well	38.7	46.0	39.2
	(558 ft/bit)	(427 ft/bit)	(559 ft/bit)
Success ratio	0.0%	60.0%	33.3%
Wildcat success ratio	0.0%	20.0%	0.0%
	(3 wells)	(5 wells)	(4 wells)
Development success ratio	0.0%	100.0%	100.0%
	(3 wells)	(5 wells)	(2 wells)
Total costs: Mud	$ 2,339	$ 3,478	$ 3,380
Drilling	$ 19,312	$31,267	$18,360
Completion	$ 2,450	Not reported	Not reported
Total	$ 21,762	$41,709	$22,962
Total footage	129,410	Not reported	Not reported

(Cost in thousand dollars except dollars per foot)

TABLE 7. Oklahoma ultradeep drilling
Wells drilled to 20,000 ft or deeper

	1979 (10 wells)	1978 (6 wells)	1977 (3 wells)
Average well depth	21,505 ft	21,182 ft	20,280 ft
Average cost/well	$8,545 ($397.37/ft)	$5,394 ($254.65/ft)	$4,025 ($198.50/ft)
Average mud cost/well	3993 (46.16/ft)	$801 ($28.36/ft)	$653 (32.20/ft)
Average bits/well	66.0 (326 ft/bit)	58.8 (360 ft/bit)	58.0 (350 ft/bit)
Success ratio	40.0%	0.0%	33.3%
Wildcat success ratio	28.6% (7 wells)	0.0% (3 wells)	0.0% (2 wells)
Development success ratio	66.7% (3 wells)	0.0% (3 wells)	100.0% (1 well)
Total costs: Mud	$ 9,927	$ 3,605	$ 1,959
Drilling	$ 72,403	$28,662	$10,247
Completion	$ 13,050	Not reported	Not reported
Total	$ 85,454	$32,365	$12,076
Total footage	215,051	Not reported	Not reported

(Cost in thousand dollars except dollars per foot)

TABLE 8. Texas ultradeep drilling
Wells drilled to 20,000 ft or deeper

	1979 (15 wells)	1978 (22 wells)	1977 (28 wells)
Average well depth	21,976 ft	21,626 ft	21,817 ft
Average cost/well	$4,642 ($211.25/ft)	$4,062 ($187.80/ft)	$3,978 ($182.34/ft)
Average mud cost/well	$512 ($23.28/ft)	$427 ($19.73/ft)	$313 ($14.35/ft)
Average bits/well	38.0 (578 ft/bit)	36.8 (587 ft/bit)	48.9 (447 ft/bit)
Success ratio	44.4%	50.0%	50.0%
Wildcat success ratio	33.3% (9 wells)	33.3% (12 wells)	33.3% (18 wells)
Development success ratio	55.6% (9 wells)	70.0% (10 wells)	80.0% (10 wells)
Total costs: Mud	$ 9,207	$ 9,385	$ 8,768
Drilling	$ 65,823	$70,291	$ 82,759
Completion	$ 14,795	Not reported	Not reported
Total	$83,562	$89,358	$111,382
Total footage	395,566	Not reported	Not reported

(Cost in thousand dollars except dollars per foot)

TABLE 9. Utah ultradeep drilling
Wells drilled to 20,000 ft or deeper

	1979 (1 well)	1978 (0 wells)	1977 (0 wells)
Average well depth	21,204 ft	0	0
Average cost/well	$5800 ($273.53/ft)	0	0
Average mud cost/well	$1,500 ($70.74/ft)	0	0
Average bits/well	71.0 (299 ft/bit)	0	0
Success ratio	0.0%	0	0
Wildcat success ratio	0.0% (1 well)	0	0
	0.0% (0 wells)	0	0
Total cost: Mud	$ 1,500	0	0
Drilling	$ 5,800	0	0
Completion	$ 0	0	0
Total	$ 5,800	0	0
Total footage	21,204	0	0

(Cost in thousand dollars except dollars per foot)

TABLE 10. Wyoming ultradeep drilling
Wells drilled to 20,000 ft or deeper

	1979 (8 wells)	1978 (2 wells)	1977 (1 well)
Average well depth	21,685 ft	21,462 ft	21,015 ft
Average cost/well	$7,111 ($327.94/ft)	$3,125 ($145.61/ft)	$3,495 ($166.31/ft)
Average mud cost/well	$1,028 ($47.42/ft)	$375 ($17.47/ft)	$300 ($14.28/ft)
Average bits/well	53.3 (407 ft/bit)	85.5 (251 ft/bit)	85.0 (247 ft/bit)
Success ratio	37.5%	0.0%	100.0%
Wildcat success ratio	33.3% (3 wells)	0.0% (1 well)	100.0% (1 well)
Development success ratio	40.0% (5 wells)	0.0% (1 well)	0.0% (0 wells)
Total costs: Mud	$ 8,227	$750	$300
Drilling	$ 45,281	$6,250	$3,015
Completion	$ 11,609	Not reported	Not reported
Total	$ 56,890	$6,250	$3,015
Total footage	173,478	Not reported	Not reported

(Cost in thousand dollars except dollars per foot)

ing by ultradeep development wells last year caused the big drop. The success ratio for 37 ultradeep wells drilled in 1971 was 94.6%, which means only three of them were dry. Last year, the development success ratio was 38.8%. It was the first time fewer than 60% of ultradeep development wells found success.

Most of last year's decline can be traced to Louisiana, which has only 3 of 11 ultradeep development wells listed as producers.

As with overall deep drilling, bit usage in ultradeep wells suffered a set-back last year, with the average ft/bit showing a 6% fall-off from 1978. Mud costs also followed the overall trend, with close to a 100% increase during the year. The 64 ultradeep wells shown in the accompanying tables, by the way, also are included in the preceding report on all U.S. deep wells. They are broken out for this supplemental report, and, if things proceed as some observers expect, an additional supplement may be necessary before the end of the 1980's to cover 30,000-ft wells.

Least expensive place to drill ultradeep wells seems to be Mississippi, where six were drilled at an average cost of $168.16/ft. Average mud cost in Mississippi was $18.07/ft – less than half of the national average for ultradeep wells.

Highest mud cost of states with more than one ultradeep well was found in Louisiana. It averaged more than $1,167,000/well for 18 ultradeep wells, and this came to $54.72/ft. Oklahoma's mud costs averaged less than a million dollars per well, but still came to $46.16/ft. Wyoming was in the same bracket.

Louisiana fared better than the national average in bit usage, however, with an average of 43.2/well. Oklahoma and Wyoming were above the average – the former by almost 20 bits/well. Mississippi and Texas both came in under the national average for bits/well, which is small consolation for Mississippi where all six ultradeep wells drilled last year were dry.

– Rich McNally and Mary Jane Ellis